RESPONSE TO OFFICE ACTION

A. Status of the Claims

Claims 1, 7, 8, 10-14, 17-22, 26, 27, 31-33, 35-41, 43-45, 49-52, and 54 were pending. Claims 1, 8, 20, 36, and 45 have been amended. Support for these amendments can be found, for example, at page 25, line 17 through page 34, line 36. Claims 1, 7, 8, 10-14, 17-22, 26, 27, 31-33, 35-41, 43-45, 49-52, and 54 are presented herein for reconsideration.

B. Rejections Under 35 U.S.C. § 112, First Paragraph

The Action rejects claims 1, 14 and 17-19 as failing to comply with the written description requirement of 35 U.S.C. § 112, first paragraph. Specifically, the Action acknowledges that the application provides written description of the "formation of embryogenic cotton callus" and "any regenerable cotton tissue," but asserts that written description is lacking for "regenerable embryogenic callus tissue" as recited in claims 1 and 14. Applicants respectfully traverse.

Applicants note that, although the specification does not use the precise sequence of terms "regenerable embryogenic callus tissue," this subject matter is fully described in the specification. *See*, for example, page 32 lines 6 through page 33, line 7. There is no requirement to describe a literal sequence of claimed terms. The relevant case-law has repeatedly made it clear that an applicant's specification need not describe the claimed invention in *ipsis verbis* to comply with the written description requirement, as long as the skilled reader understands that the text, taken as a whole, conveys the same meaning. *See Ex Parte Sorenson*, 3 U.S.P.Q.2d 1462, 1463 (Bd. Pat. App. & Interf. 1987). An analysis of whether a specification provides an adequate written description of a claimed invention requires one to read the complete specification to determine whether "the text

as a whole" conveys the invention. *See Union Oil Co. v. Atlantic Richfield Co.*, 208 F.3d 989, 996 (Fed. Cir. 2000).

Here, the summary and Examples, as a whole, describe induction of embryogenic cotton callus, maturation of embryogenic cotton callus, embryo germination, and a media used to germinate mature embryos into plants. *See* Summary and Examples in the Specification. For example, page 32 lines 6 through page 33, line 7 of the specification describe the following:

> Embryos were induced as outlined in Examples 2, 3, and 4. After eight weeks, the embryogenic tissue that formed was transferred to an embryo maturation media as described in Examples 5 and 6. Cultures were monitored for the presence of actively growing embryos.
>
> About every four weeks, actively growing tissue and small embryos were removed and placed on fresh maturation media. The embryos were spaced on the culture plates with adequate room for growth. The tissue was returned to the warm room and incubated under the same growth conditions.
>
> Embryos larger than about 5 mm were transferred to a germination media (Stewart and Hsu, Planta 137:113-117, 1997) with various carbohydrate concentrations and 0.25 g/L GELRITE. The embryos are incubated at 28°C. in a lighted incubator with a 16/8 day/night cycle.
>
> Various concentrations of glucose and sucrose in the germination media were tested. The germination media comprised sucrose or glucose at concentrations ranging from about 0%-2% (w/v). The results demonstrated that using germination media containing glucose or sucrose concentrations ranging from about 0% to 0.5% (w/v) significantly increased the frequency of embryo germination and plantlet formation (Table 10).
>
> After embryos had germinated and developed about 3-4 leaves, the tissues were transferred to a larger container containing the same germination media. Once the plants developed 4-6 total leaves, they were transferred to pots containing Metro-Mix 350 and slowly hardened off.

Accordingly, the specification fully describes embryogenic callus tissue and regenerating plantlets from the embryogenic callus tissue. Since the described embryogenic callus tissue had the ability to regenerate into plantlets, one of skill in the art would clearly recognize that they are, in fact, regenerable embryogenic callus tissue. Therefore, the specification complies with the written description requirement, and thus Applicants respectfully request that the rejection of claims be withdrawn.

C. Rejections Under 35 U.S.C. § 102(b)

Claim 1 is rejected under 35 U.S.C. § 102(b) as being anticipated by Canadian Patent No. 1,309,367, issued to Finer ("Finer"). The Action alleges that Finer discloses culturing a hypocotyl derived non-embryogenic callus tissue under dark lighting condition to obtain a regenerable embryogenic callus tissue. Applicants respectfully traverse.

Applicants have amended claim 1 herein to recite "transforming the non-embryogenic cotton callus tissue with an exogenous nucleic acid sequence, culturing the transformed non-embryogenic cotton callus tissue." Accordingly, claim 1 requires the step of transforming the non-embryogenic cotton callus tissue. Nowhere does Finer disclose, teach or suggest this transformation step.

To anticipate a claim, the cited reference must expressly or inherently teach each and every element as set forth in the claim. MPEP 2131. The Action relied on Abstract and page 3, lines 26-28 to assert that Finer discloses a method of culturing cotton cell masses. The cultured cell masses in these relied upon portions are not transformed callus tissue. Rather, they relate to untransformed cotton cell masses.

As such the rejection is believed moot and withdrawal thereof is respectfully requested.

D. Rejections Under 35 U.S.C. § 102/103

Claim 1 remains rejected under 35 U.S.C. § 102(b) as being anticipated by Smith *et al.*, *In Vitro* (1977) vol. 13, pages 329-334, ("Smith"). According to the Action, Smith discloses a method of culturing cotton callus under dark conditions. Applicants respectfully traverse.

As discussed above, the amended claim 1 requires the step of transforming the non-embryogenic cotton callus tissue. Nowhere does Smith disclose, teach or suggest this

transformation step. Additionally, the Action relied on Abstract and page 330, paragraphs 2-5 to assert that Smith discloses a method of culturing cotton callus tissues. However, these relied upon portions relate to culturing cotyledon and hypocotyl explants to initiate callus. In contrast, the invention includes the subsequent steps of transforming non-embryogenic callus tissue and culturing the transformed non-embryogenic callus under a suitable condition so that the transformed non-embryogenic callus would induce embryogenic callus tissue.

Furthermore, Applicants note that the amended claim 1 recites hypocotyl tissue and thus requires embryogenesis and regeneration of cotton callus tissue derived from a hypocotyl. Smith does not describe any embryogenesis or regeneration of cotton callus tissue derived from a hypocotyl. On the contrary, although hypocotyl tissue was described as a tissue source for *G. arboreum* callus formation, no embryogenesis or regeneration was observed from this tissue (*e.g.* Smith, page 332, last paragraph, right column, and following). As Smith does not recite all of the limitations of claim 1, it does not anticipate the claim.

Smith further does not render the claims obvious. As discussed above, these relied upon portions in Smith relate to culturing cotyledon and hypocotyl explants to initiate callus. In contrast, the invention relates to subsequent stages of callus maturation. Optimal environmental conditions specific for callus maturation are unpredictable based on the environmental conditions for callus initiation. This is because plants' physiological mechanism responds differently at different stages of growth and development. Callus is a distinct tissue type that requires different hormones, nutrients and a different environment relative to other types of tissue, and is not the same as embryogenic tissue and germinating embryos. The tissues look different and respond differently in culture. Callus is generally soft, green to cream color, fast growing, requiring hormones and light, and preferring glucose as carbohydrate. Embryogenic callus is generally hard, brown and slow

growing, requiring no hormones, having better growth in dark, with preference for a solid support and glucose as carbohydrate. Germinating embryos are still again different in morphology and growth. The claimed concepts are therefore not mere adaptations of prior art techniques.

Applicants therefore note that, as discussed in the previous response dated October 11, 2007, the conditions for plant regeneration are distinct, employing, for instance, different levels of plant growth hormones. Thus it is surprising that Smith achieved any plant regeneration (*i.e.* from callus cells) even from cotyledon tissue. Since this "regeneration" event was unique, no reasonable expectation would exist that such a procedure could be modified for other purposes.

While cotton callus initiation generally has been known for many years, perhaps since the early or mid 1970's (*e.g.* cited Davis and Smith references), conditions leading to successful cotton embryogenesis, embryo maturation, and plant regeneration were not defined until much later. Indeed, the present application is precisely concerned with conditions for cotton embryogenesis, embryo maturation, and plant regeneration that yield surprisingly improved results.

Accordingly, one of skill in the art would have been without reasonable expectation at the time of filing of the patent application that the claimed conditions for culturing non-embryogenic calli would induce embryogenic calli that has ability to regenerate into a whole plant.

As such, the rejection is believed moot and withdrawal thereof is thus respectfully requested.

E. Rejections Under 35 U.S.C. § 103(a)

(1) Rejection of claims 1, 8, 10-12, 14, 17, and 18 under 35 U.S.C. § 103(a)

The Action rejects claims 1, 8, and 14 under 35 U.S.C. § 103(a) as being unpatentable over Firoozabady *et al., In Vitro Cell Dev. Biol.* (1993), vol. 299, pages 166-178 ("Firoozabady 1993"),

in view of Davis *et al., In Vitro* (1974), vol. 9, pages 395-398 ("Davis"), and further in view of Chi *et al., Plant Cell Reports* (1990), vol. 9, pages 195-198 ("Chi"). The Action asserts that Firoozabady 1993 teaches culturing embryogenic cotton callus under dark conditions, Davis teaches adding ascorbic acid in a medium to form cotton callus tissue, and Chi teaches adding aminoethoxyvinylglycine ("AVG") in a shoot regeneration medium.

Applicants note that claims 1, 8, and 14 are independent claims. The rejection of claim 1 was apparently made solely on the basis of the Firoozabady 1993 reference, and the rejections of claims 8 and 14 were apparently made by combining Firoozabady 1993 and Davis and Firoozabady 1993 and Chi, respectively. As these claims are distinct independent claims, Applicants disagree with the rejection of these independent claims as a group. Applicants point out that each of these independent claims includes distinct limitations that may be utilized separately, and thus traverse the rejections separately.

Claim 1

The Action relied on page 169, right column, last paragraph in Firoozabady 1993 to assert that embryogenic callus was cultured in media under complete darkness. However, this relied upon portion does not describe such culture conditions for embryogenic callus. Instead, the callus referred to as grown in darkness at page 169 is non-embryogenic callus, growth of which having just been initiated and is being maintained, in the absence of embryogenesis. This is clearly the case because (1) the callus of the second and third sentences of this paragraph is not referred to as embryogenic callus; and (2) the following (fourth) sentence bridging pages 169-170 explicitly relates to embryogenic callus formation, further indicating the distinction between (non-embryogenic) callus and embryogenic callus. Applicants also note, as discussed in previous responses, that the cited reference teaches away from using darkness for embryogenic callus

formation and growth, instead teaching that "high temperature and low light (9μE/ m^{-2} s^{-1}) were preferred…" [page 170, left column; underlining added]. Although the Action points to page 171, right column 1st full paragraph, of Firoozabady 1993 regarding growth of embryos to produce plants, Applicants respectfully note that this portion of the cited reference does not describe any lighting conditions for such growth. To clarify, a schematic flowchart showing some of the steps is provided as follows:

Growth Stage	invention	Firoozabady 1993
Explant (*e.g.* hypocotyl piece)		
↓ (callus initiation)		light does not matter high temp
Non-Embryogenic Callus		transformed
↓ (embryogenic callus formation)	Dark antioxidant sealing	low light high temp
Embryogenic callus		
↓ (embryo induction)		
Embryos		
↓ (embryo maturation)	Filter paper Amino acid hydrolysate	
Mature embryos		
↓ (embryo germination and plant growth)		
Plant		

Additionally, the specification of the instant application shows that transgenic calli cultured under dark conditions produced about 2-5 times more embryogenic calli than calli cultured under light conditions. *See* specification at page 34, Table 11. Also, regeneration efficiency for dark

induced transgenic embryogenic calli was about 15 times higher than light induced calli. *See also* specification at page 34, Table 11. These conditions increased production of transgenic embryogenic calli under dark and regeneration efficiency, which is surprising, unpredictable, and unexpected in view of Firoozabady 1993's teachings of culturing non-transgenic calli under its preferred light conditions discussed above.

The addition of Davis or of Chi is not asserted to be for the purpose of curing any defect in Firoozabady 1993 and instead these references are explicitly stated to be combined with Firoozabady for the purpose of the ascorbic acid and AVG limitations of independent claims 8 and 14. These references do not cure the defect regarding growth of cotton callus tissue in the dark to obtain embryogenic callus. As such the rejection is believed moot, and therefore withdrawal of the rejection is respectfully requested.

Claims 8, and 10-12

The Action combines Firoozabady 1993 with Davis to reject claims 8, and 10-12, relating to use of an antioxidant such as ascorbic acid (Action, page 7, 1st paragraph). The Action finds it would be *prima facie* obvious to one of skill in the art to combine the cited references to arrive at the invention. Applicants respectfully traverse.

Claim 8 is directed to inducing embryogenic calli from regenerable non-embryogenic calli in presence of an antioxidant in culture media. Claims 10-12 are dependent claims that depend from claim 8. Applicants again note that the cited Davis reference does not relate to growth of regenerable or embryogenic callus, or to culturing callus in an embryo-inducing medium. Indeed the terms "embryogenic" or "embryogenesis" are not even found in Davis. As noted previously, the term "regeneration" is found at page 397, left column, 3rd line. However this term is used in the context of undifferentiated callus maintenance and proliferation, in view of removal of portions of

tissue from a culture being maintained for callus growth. The term does not refer to regeneration of a plant by inducing formation of an embryo.

At page 7, 1st paragraph, the Action asserts that Davis was combined to show that ascorbic acid might be added to enhance the growth of callus tissue [underlining added]. Applicants again note that claims 8, and 10-12 do not relate to growth of callus tissue *per se* but rather to growth of embryogenic callus tissue in an embryo-inducing medium. One of skill in the art of cotton cell culture would understand that a cotton callus cell culture is distinct from a cotton embryogenic callus cell culture, for instance in terms of the conditions under which it is grown and the physiological state and developmental potential of the cells.

The art of cotton cell culture at the time of the Davis reference had not successfully grown embryogenic cotton cells, or cotton cells that were regenerable. The Davis reference, to the extent that it even might apply to culture of embryogenic cotton cells, which Applicants do not concede, would provide no expectation of success, since induction of embryo formation is known to require different conditions than maintenance of a non-differentiated callus culture. As such the rejection is believed moot, and therefore withdrawal of the rejection is respectfully requested.

Claims 14, 17, and 18

The Action combines Chi with Firoozabady 1993 to support the rejection of claims 14, 17, and 18 (see Action, page 7, 1st paragraph) relating to the use of AVG. The Actions asserts that Chi teaches adding AVG for regeneration. The Action finds it would be *prima facie* obvious to one of skill in the art to combine the cited references to arrive at the invention. Applicants respectfully traverse.

Applicants initially note again that *Brassic*a species are not closely related to cotton plant species. A brief comparison of some of the differences between *Brassica* and cotton cell culture and regeneration is provided:

Cotton	**Brassica**
Perennial	annual
Woody	herbaceous
Family Malvaceae	Family Cruciferae
Regeneration via embryogenesis (as described)	Regeneration via organogenesis
$AgNO_3$ does not promote regeneration	$AgNO_3$ reported to promote regeneration
Hormones used in cell culture: 2,4-D and kinetin	Hormones used in cell culture: BA and NAA
regeneration time: ~20 weeks	regeneration time: ~10-14 days

Among the many differences described above, importantly, regeneration in Brassica is via organogenesis, which is developmentally distinct from the embryogenic regeneration of cotton described in the present application. That is, in Brassica, formation of embryos is not required to yield the structures that eventually grow into plants. Instead, organs (*i.e.* shoots) can form directly from dividing cells within explants. In view of the limitations of claim 14, which specifically relate to formation of embryogenic cotton callus, the teachings of Chi simply does not apply to the claimed invention, and would give a skilled practitioner no expectation of success in improving the efficiency of cotton plant regeneration. Applicants respectfully submit that the rejection is based on an oversimplification of the cited reference, and respectfully request that it be withdrawn.

Applicants also note that Chi states that "$AgNO_3$ was generally more effective in promoting shoot formation than AVG, which appears to be inhibitory to shoot regeneration of ssp. chinensis

and ssp. parachinensis..." [Chi, page 196, last paragraph, and following to page 197; and Table 1]. Later (page 197), the reference states "The effect of AVG and $AgNO_3$ on shoot regeneration varies with genotype and explant source." Thus, again, if there were that much variation in response to AVG among subspecies within a single species (*B. campestris*), one of skill in the art would simply have had no expectation of success in routinely applying the teachings of Chi to an entirely different family of plants. The Action provides no rationale as to how application of Chi would be applied to Firoozabady 1993 in view of this. For this reason as well, a *prima* facie case of obviousness has not been established, and Applicants respectfully request that the rejection of the claims be withdrawn.

(2) Rejection of Claims 7, 13, 19-22, 26-27, 45, and 49 under 35 U.S.C. § 103(a)

The Action rejects claims 7, 13, 19-22, 26-27, 45, and 49 over Firoozabady 1993, in view of Davis and further in view of Chi and further in view of Gould, *Plant Cell Rep.*, 1991, vol. 10, pages 12-16 ("Gould") under 35 U.S.C. § 103(a). The rejection apparently relates to the limitations that recite that the claimed tissue is transformed or transgenic. The Action appears to rely on Gould to teach these limitations. The Action finds it would be *prima facie* obvious to one of skill in the art to combine the cited references to arrive at the invention. Applicants respectfully traverse.

Applicants submit that the Gould reference describes transformation of cotton apical meristems. Thus, it essentially represents an alternative approach whereby transformed cotton plants may be obtained without the necessity of taking cells through somatic embryogenesis. Thus, the reference is not apt, as it does not apply to the claimed invention. A brief summary of some of the differences between these approaches for obtaining transformed cotton tissue is supplied again as follows:

Embryogenesis	Apical meristem approach
Explant contains no preformed buds	explant: contains preformed buds
Explant tissue: hypocotyl or cotyledon	Explant tissue: shoot meristem
Uses a callus stage	does not use a callus stage
Produces embryos in culture	does not produce embryos in culture
Regenerates from a single cell	regenerates from a group of organized cells
Hormones used: 2,4-D and kinetin	Hormones used: IAA and kinetin
Regeneration via embryogenesis	Regeneration via organogenesis
Genotype dependent	Genotype independent
Resulting plants have "extensive phenotype abnormalities"	Resulting plants "exhibited normal phenotype"

(Quotes are from Gould)

The Gould reference contains repeated comparisons of their described technique with that of cotton regeneration via embryogenesis, highlighting numerous differences. For instance, the presently claimed methods require callus formation, in order to subsequently produce embryogenic callus, embryos, and plants. In contrast, at page 14, left column, 2nd paragraph, Gould discusses using low levels of IAA, in order to maintain apex organization and to avoid callus formation.

Further, Gould's description of the chromosomal and phenotypic abnormalities seen when cotton plants are regenerated via somatic embryogenesis as compared to their described apical meristem approach teaches away from use of an embryogenesis-based system. This and the numerous other differences between the somatic embryogenesis and shoot apical meristem approaches described above also clearly indicate that a skilled practitioner would have no expectation of success in applying the teachings of Gould to the methods of the present invention.

Indeed, it is entirely unclear which of the teachings of Gould might be applied to the methods of the present invention in order to achieve any successful result at all, and Applicants

respectfully request such teachings be pointed out. One of skill in the art of cotton cell culture and transformation simply would not apply the teachings of Firoozabady, Davis, and/or Chi, relating to callus cell culture of cotton and somatic embryogenesis of cotton, with the teachings of Gould, which relate to culture and transformation of cotton apical meristems and regeneration of plants via organogenesis. No *prima* facie case of obviousness has been established, and the Applicants thus respectfully request that the rejection be withdrawn.

(3) Rejection of Claims 31-33 and 35 under 35 U.S.C. § 103(a)

The Action alleges that claims 31-33 and 35 are unpatentable under 35 U.S.C. § 103(a) over Firoozabady 1993 in view of Davis and further in view of Chi and further in view of Firoozabady *et al.*, 1987, *Plant Molecular Biology*, vol. 10, pages 105-116 ("Firoozabady 1987"). The Action asserts that Firoozabady 1987 teaches culturing cotton tissue on a support matrix such as filter paper. The Action finds it would be *prima facie* obvious to one of skill in the art to combine the cited references to arrive at the invention. Applicants respectfully traverse.

As discussed in previous responses, Firoozabady 1987 only describes use of filter paper for transformation during co-culture of cotyledon pieces with *Agrobacterium*. This is an early step in the overall transformation and regeneration process, and the use of filter paper is described as being in order to avoid overgrowth of bacteria on plant tissues. Embryogenic cotton tissue is not being placed on filter paper; rather, cotyledon pieces are being placed on filter paper. After the co-cultivation step, Firoozabady 1987 teaches that plant tissues be transferred to growth medium without filter paper (page 107, right column, 3rd full paragraph). This teaches away from use of filter paper during steps subsequent to co-cultivation. In contrast, claims 31-33 and 35 explicitly recite that the use of filter paper is in conjunction with transgenic embryogenic cotton tissue,

following induction of embryogenesis of already transformed but non-embryogenic tissues. The use of filter paper therefore is recited to be well after any co-cultivation or other transformation step.

Applicants also note that the step in Firoozabady 1987 that would be most comparable with the presently claimed use of filter paper is actually found at page 108, first paragraph left column, section entitled "Regeneration of transgenic plants." In this section, Firoozabady 1987 describe induction of embryogenesis in previously transformed (but non-embryogenic) callus, to produce and germinate somatic embryos. No use of filter paper at this stage is taught or contemplated by Firoozabady 1987. Thus it is unclear to Applicants how the teachings of Firoozabady 1987 would render these claims obvious, even if they were applied, and no *prima facie* case of obviousness has been established. In view of the above, withdrawal of the rejection is respectfully requested.

(4) Rejection of Claims 36-38 under 35 U.S.C. § 103(a)

The Action rejects claims 36-38 as being unpatentable over Gould in view of U.S. Patent No. 5,244,802, issued to Rangan ("Rangan"). The Action asserts that Rangan teaches adding hydrolysate to promote somatic embryos. Applicants respectfully traverse.

As noted above, the teachings of Gould relate to culture of cotton shoot apical meristems, in which plants are regenerated via organogenesis. No callus step is required, or desired, and as also noted above, Gould explicitly attempts to avoid callus formation, which would interfere with the organization of the apical meristem tissues and their ability to produce a regenerated plant via organogenesis. In contrast, as noted by the Action, Rangan relates to cotton plant regeneration in which casein hydrolysate is added to a medium designed to promote embryogenesis during callus cell growth.

Applicants respectfully note that Gould does not teach or describe culturing of embryogenic cotton tissue. Instead, Gould describes apical meristem culture, and repeatedly distinguishes

between these two culture approaches for cotton plant regeneration. The Action also asserts that it would have been obvious to combine the methods of Gould with the method of Rangan. It is entirely unclear to the Applicants how addition of casein hydrolysate to an apical meristem culture taught by Gould would be applicable, let alone that one of skill in the art would have any expectation of success in doing so, or even any motivation to attempt such a combination. As discussed above, Gould repeatedly teaches away from the embryogenesis approach for cotton plant regeneration. The two references relate to distinct approaches for regeneration of cotton plants. No *prima* facie case for obviousness has been established. Withdrawal of the rejection is respectfully requested.

(5) Rejection of Claims 39-41, 43 and 44 under 35 U.S.C. § 103(a)

Claims 39-41, 43, and 44 are rejected under 35 U.S.C. § 103(a) as unpatentable over Firoozabady 1993 in view of Davis further in view of Chi further in view of Firoozabady 1987, and further in view of Rangan. The Action finds it would be *prima facie* obvious to one of skill in the art to combine the cited references to arrive at the invention. Applicants respectfully traverse.

Claim 39 explicitly recites that non-embryogenic tissue is cultured via use of an antioxidant, an ethylene inhibitor, and dark lighting conditions to produce embryogenic tissue, and use of a support matrix, and an amino acid hydrolysate is then recited in culturing the derived embryogenic tissue. As noted above and in previous responses, Firoozabady 1993, Davis, Chi, and Firoozabady 1987, taken together, do not teach or motivate a skilled practitioner to practice the claimed invention, such as by use a support matrix (*e.g.* filter paper) in culturing embryogenic tissue. Firoozabady 1987 teaches away from such an attempt, since filter paper is only utilized with cotyledon pieces (non-embryogenic, non-callus tissue), and filter paper is taught to be removed prior to induction of embryogenesis. The addition of Rangan does not cure this defect regarding use

of a support matrix. Rangan only describes use of filter paper for insect bioassays (Examples 14-15).

Further, Rangan is asserted to be combined in view of its teachings regarding addition of amino acid hydrolysate. Although Rangan describes use of amino acid hydrolysate with non-transformed tissue (embryogenic callus and embryos), during what is apparently an embryo maturation and germination phase of growth, this does not relate to the limitations regarding prior culture of non-embryogenic cotton callus tissue under dark conditions, as recited in the claims, and hence Rangan does not cure the defect of Firoozabady 1993 in the rejection of these claims.

Further, although the Action asserts that embryogenic callus was cultured in media under complete darkness, referring to the cited reference, at page 169, right column, last paragraph, this paragraph does not describe such culture conditions for embryogenic callus. Instead, as discussed above, the callus referred to as grown in darkness at page 169 is non-embryogenic callus, growth of which having just been initiated and is being maintained, in the absence of embryogenesis. This is clearly the case because, as discussed above, (1) the callus of the second and third sentences of this paragraph is not referred to as embryogenic callus; and (2) the following (fourth) sentence bridging pages 169-170 explicitly relates to embryogenic callus formation, further indicating the distinction between (non-embryogenic) callus and embryogenic callus. Applicants also note that Firoozabady 1993 teaches away from using darkness for embryogenic callus formation and growth, instead teaching that "high temperature and low light (9μE/ m^{-2} s^{-1}) were preferred..." [page 170, left column; underlining added].

In view of the many possible variables in such plant cell culture experiments and also the limitations of claims 39-41, 43, and 44, one of skill in the art of plant cell culture would have had no motivation to combine the teachings of Firoozabady 1993 and Rangan. Such a combination would

only be obvious with hindsight. Even if the references were combined, in total they offer no expectation of success, and as noted, teach away from use of limitations recited in these claims. In view of the above, the cited references therefore neither teach nor suggest all elements of the claims to one of skill in the art, and a *prima facie* case of obviousness has not been established. Applicants respectfully request that the rejection of claims 39-41,43, and 44 be withdrawn.

(6) Rejection of Claims 50-52 and 54 under 35 U.S.C. § 103(a)

The Action rejects claims 50-52 and 54 under 35 U.S.C. § 103(a) as being unpatentable over Firoozabady 1993 in view of Davis, Chi, Firoozabady 1987, Rangan, and further in view of Gould. The rejection apparently relates to use of a sealing material. The Action finds it would be *prima facie* obvious to one of skill in the art to combine the cited references to arrive at the invention. Applicants respectfully traverse.

As noted above and in previous responses, Gould relates to culture of shoot apical meristems, and would not be applied by one of skill in the art regarding embryogenic cotton cell culture. Further, Gould explicitly describes culturing under continuous high light conditions (90 μE m^{-2} s^{-1}; Gould, page 13, left column). In contrast, the present claims explicitly recite dark lighting conditions, limited light conditions, or under green light. Thus, Gould teaches away from use of the recited lighting conditions. Thus no motivation to combine Gould with the other references is provided, and a *prima facie* case of obviousness has not been established by the Action.

Even if such motivation did exist for the sake of argument, given the numerous differences between the work of Gould and the other cited references, as well as the numerous defects regarding combining the other cited references, Applicants submit that it would not be clear to a skilled practitioner which of the numerous contradictory teachings among these 6 references to pick and choose to arrive at the presently claimed invention. The cited references therefore neither teach nor

suggest all elements of the claims to one of skill in the art. The references in total also do not give a skilled practitioner any expectation of success, and teach away from the claimed method in instances outlined above. Applicants respectfully request that the rejection be withdrawn.

F. Conclusion

In view of the above, it is submitted that all of the rejections to the claims have been overcome, and the case is in condition for allowance.

The Examiner is invited to contact the undersigned at (214) 259-0931 with any questions, comments, or suggestions relating to the references patent application.

Respectfully submitted,

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